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Managing
Watersheds



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Cover: Backslope terraces and floodwater-retarding structures protect a small watershed in western Iowa from soil erosion, silting, and downstream flooding. (Photo by Tim McCabe.)

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Comments from the SCS Chief:

Cooperating for Resource Management

THE CONCEPT OF treating a watershed is a useful one in soil and water conservation. It offers the opportunity to bring neighboring landowners together in cooperative efforts to manage their resources and solve common problems.

Many of these cooperative efforts are the work of local sponsors of small watershed projects under Public Law 83-566 (P.L. 566). Though we tend to associate P.L. 566 with flood- and sediment-control structures, the program offers a variety of solutions aimed at resource conservation.

P.L. 566 is a program in transition. In the past several years, it has evolved from primarily addressing problems such as flood control and water management with measures such as channels, floodwater retarding structures, and grade stabilization structures to one featuring land treatment measures. It has evolved from large expensive projects that took many years and millions of dollars to complete, to smaller projects that can be planned and installed in 3 to 5 years and feature cost sharing on conservation measures with individual farmers and ranchers.

It is important however to understand that the watershed program continues to be an excellent tool for addressing flood control, water management, and other resource problems in rural areas.

Small watershed projects involving the Soil Conservation Service provide measurable public benefits. By conserving water, for example, watershed projects completed years ago in the Midwest and West made it easier for these regions to contend with this year's drought. And the participating farmers who are maintaining their conservation systems are ahead in the race to comply with the conservation provisions of the Food Security Act of 1985.

P.L. 566 small watershed projects are tailored to meet local needs. Once local officials and landowners set their priorities for resource conservation and rural development, we can work together, through the local conservation districts, to find the program or combination of programs that best meets their needs. That's what good conservation planning is all about.



Watersheds

The Nation's Watersheds

A WATERSHED is an area of land where the water drains to a common point or body of water. Watersheds can be as large as half a continent or as small as a backyard. And small watersheds usually make up larger watersheds.

But a watershed is more than a useful concept. From conservation planning on a single farm, to interstate river basin studies, to the regional effort to clean up the Chesapeake Bay, nearly all the work done by the Soil Conservation Service involves a watershed. And the drainage patterns and land

uses in the watershed—as much as the soils and climate—can determine the nature of the resource problems and their solutions.

The Small Watershed Program (P.L. 566) and the Emergency Watershed Protection Program are two SCS programs designed specifically to help landowners in particular types and sizes of watersheds to address particular types of resource problems.

Under P.L. 566, SCS helps local organizations plan and carry out projects to protect small watersheds from erosion and sedimentation damage and to reduce upstream flooding. These projects also conserve water, improve water quality, provide municipal and industrial water supplies, increase opportunities for recreation, and improve fish and wildlife habitat.

Most P.L. 566 projects consist of both structural and nonstructural (land treatment) practices. For

flood prevention, SCS provides technical assistance and pays all engineering and construction costs. For most other purposes, SCS provides technical assistance and shares the installation costs. Of a total of about 1,550 P.L. 566 projects, about 700 have been completed, 650 are currently being installed, and 200 are now being planned.

The Emergency Watershed Protection Program authorizes SCS to help remove debris and repair watersheds damaged and left hazardous by floods, fires, and other natural disasters. In recent years, SCS has funded an average of more than \$23 million a year in emergency watershed work.

The following articles report on some of the agency's watershed activities.



With assistance from the Soil Conservation Service, all of the land in this small watershed in Garrett County, Md., is under conservation treatment.

"SCS did an outstanding job in moving as fast as they did and in the quality of work done."

Fast Work Follows Flood

FLOODS NOT ONLY take heavy tolls in human lives and property, but can also clog streams, erode stream-banks, and leave the area in more danger than before. Under such threatening conditions, the Soil Conservation Service is authorized to take emergency action to protect the watershed.

In the summer of 1986, temperatures exceeding 100 degrees had parched the land in South Carolina, leaving it vulnerable to flooding. In mid-August, a series of sudden storms in Newberry, York, and Chester Counties washed out eight bridges and clogged streams with silt and debris. Four persons were killed.

An SCS damage team, under provisions of the Emergency Watershed Protection Program, moved in to help. An onsite assessment was made and within 24 hours after the final storm, the agency allocated \$500,000 for the stricken areas.

SCS personnel worked overtime to develop detailed engineering plans and specifications for the work to be done. In all, 23 contracts were approved for the immediate removal of debris from bridges, culverts, stream channels, and other water courses and for armoring heavily eroded areas with riprap.

"I have to keep pinching myself to realize that the Federal Government can move this fast," said Wyman Cook, chairman of the Newberry County Council. "SCS served the people of Newberry County well."

Newberry Soil and Water Conservation District Chairman Walter Cousins also lauded SCS. "SCS did an outstanding job in moving as fast as they did and in the quality of work done."

David C. White, branch chief, Public Information Division, SCS, Washington, D.C.

SCS Deputy State Conservationist Niles Glasgow explains emergency watershed work in Newberry County, S.C., to a television news crew.



"When the Small Watershed Program changed to allow land treatment projects, it fit our needs perfectly. Our project was one of the first in the Nation accepted under the new change."

Dramatic Change in Idaho Watershed

IN JUST 7 YEARS, a dramatic change has taken place in the Rock Creek Watershed of Power County, Idaho. The steep, rolling cropland is covered with protective residues and 200 miles of terraces instead of the telltale signs of soil erosion.

The incentive that has helped farmers change the landscape and practice conservation during tough economic times is the Rock Creek Watershed Protection Project, sponsored by the Power

Soil Conservation District with technical and financial help from the Soil Conservation Service. A few white knobs still show on some of the hilltops—a sign that the soil has eroded down to the subsoil—but even that is changing as farmers in the watershed seed highly erodible land to permanent grass under the Conservation Reserve Program (CRP).

"We spent 16 frustrating years working with SCS to try to figure out a way to solve our erosion problems," said Willis Williams, chairman of the conservation district. "When the Small Watershed Program changed to allow land treatment projects, it fit our needs perfectly. Our project was one of the first in the Nation accepted under the new change."

SCS District Conservationist Jim Stalnaker said Power County farmers are well on their way to achieving the goal of reducing annual soil loss from 26 tons per acre to about 5 tons per acre and cutting sedi-

ment deposits in an irrigation storage reservoir by 76 percent.

A total of 36 farmers in the watershed have developed conservation plans and signed contracts agreeing to install the conservation practices on a 3 to 8-year schedule. SCS pays 75 percent of the application or installation cost of approved practices.

Cecil Weisenburger was the first farmer to complete his contract, which he signed in November 1983. Using some \$94,900 of Federal cost-sharing funds, Weisenburger installed almost 11 miles of terraces on 982 acres and uses no-till on about 1,100 acres. Subsoiling, cross-slope farming, and a conservation cropping system are also part of his operations. Most of the participating farmers use this mix of practices, along with chiseling.

Project planning for the Rock Creek Watershed, with its 91,000 acres of mostly nonirrigated cropland, involved the development of five watershed protection plans on a subwatershed basis over a 5-year period. Counting the contributions of other programs, such as the CRP, 84 percent of the land has now received conservation treatment. All of which adds up to a dramatic change in the landscape of the Rock Creek Watershed.

Sharon Norris, public affairs specialist, SCS, Boise, Idaho



Conservation land treatments are reducing soil erosion and the amount of sediment carried downstream in the Rock Creek Watershed of Power County, Idaho.

All together, the project was completed at just under \$17,000, or less than a quarter of what it would have cost to put in a flood-retention dam.

Terraces Cure Flood Problems

FLOOD PROBLEMS may be the symptoms and not the disease. In such cases, installing soil conservation practices in the watershed can be a better cure than trying to handle floodwaters.

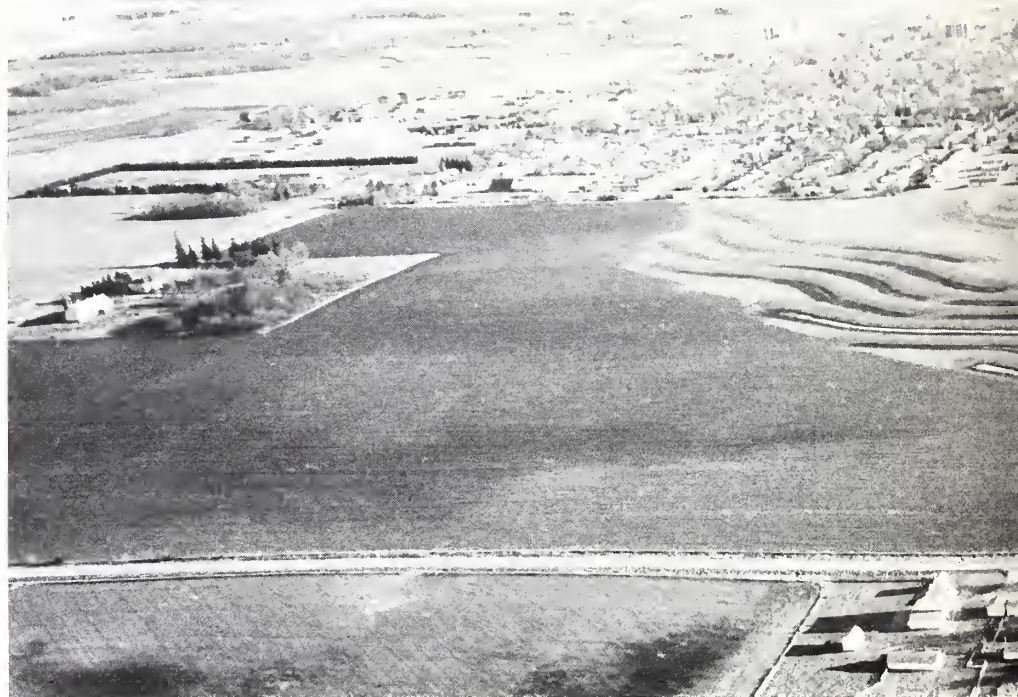
During June 1984, Rock County, Minn., was pounded by two high-intensity rainstorms within a week. Each storm dumped more than 2 inches of rain in less than 2 hours and caused severe flood damage for many residents on the north side of the community of Luverne.

One homeowner reported \$10,000 in property losses, but said her greatest fear was that the incident could become an annual event. Runoff from an adjacent farm field, carrying cornstalks and

silt, filled streets, storm sewers, and houses with mud. Don Block, another north side resident, said, "It's the worst flooding we've experienced since this part of town was developed."

After viewing the damages, the City Council contacted a private engineering firm in search of a solution. Three alternatives were proposed and all were geared at trying to handle the runoff from heavy storms. The alternatives ranged from an \$80,000 retention dam, to a \$300,000 drainage ditch, to more than \$1 million for a new storm sewer system.

At this point, the city administrator contacted the Rock County Soil and Water Conservation District for advice on controlling soil erosion in the field. District officials suggested a joint meeting with the



owner of the field, the renter, representatives from the city, and the local staff of the Soil Conservation Service.

The meeting ended with the landowner and renter agreeing to install a set of level terraces on the 18-acre field west of a drainage-way. The terraces would be designed by SCS to adequately catch and hold up to 4.8 inches of rainfall.

Objectives of the design were to reduce the rate of soil loss on the field from 10.7 tons per acre per year to 2.5; reduce the potential amount of runoff entering Luverne by 1.7 million gallons, thereby reducing the threat of flood damage; and improve the quality of water entering the Rock River by reducing the sediment load.

By the fall of 1984, five level terraces extending 3,800 feet were constructed for about \$3,700. The following spring and summer the terraces went unnoticed, but then on the 4th of September 3.5 inches of rain fell in less than an hour and 20 minutes. All five terraces, by then covered with soybeans, performed admirably, filling one-half to three-quarters full and not allowing runoff to enter the city.

This success prompted the landowner and renter to push forward with the second half of the project. In December 1986, seven more terraces totaling 7,740 feet were installed at a cost of about \$7,000. A State grant for about \$5,000, which was obtained on behalf of the city through the efforts of the conservation district, was used to pay 75 percent of the earthwork costs.

Over a period of 3 years, the city provided another \$9,000 to the project, most of which went for a tile outlet system. All together, the project was completed at just under \$17,000, or less than a quarter of what it would have cost to put in a flood-retention dam. This past July, it was named State winner and national finalist in the Take Pride In America campaign.

"The costs turned out much better than anticipated," said Block. "My wife and I think the Soil Conservation Service did a heck of a job organizing and completing this project."

James R. Ayres, district conservationist, SCS, Las Vegas, Nev., and formerly district conservationist, Luverne, Minn.



Level terraces protect the community of Luverne, Minn., at top, from runoff damage.

"The water is 10 times less turbid than the State requires," he said. "And we know there's a direct correlation between turbidity and water purity."

Dam 638 Is More Than a Name

ITS OFFICIAL name is PA 638. But to residents of the central Pennsylvania town of Beaver Springs, PA 638 represents much more than the numerical designation of a watershed dam.

PA 638 means a long-term source of fresh drinking water. And to the hundreds of residents who live below Beaver Springs, it represents welcomed flood protection.

The dam called PA 638 was completed in 1983 as part of the Middle Creek Watershed Project. Before that, Beaver Springs residents relied on a single well and a stream intake for their water. During summer dry periods, local authorities had to restrict water use to prevent serious water shortages.

Paul Woodling, a former member and current chairman of the Spring Township Municipal Authority, foresaw a time when the well might run dry. "Beaver Springs had some real problems during drought conditions," Woodling said. "We were pumping water 20 plus hours a day to keep up with the demand."

Working closely with area officials during the project was Charles Huff, district conservationist at the Middleburg field office of the Soil Conservation Service. According to Huff, the dam is 61 feet high, forms a 24-acre lake, and is designed to store the runoff from a storm so intense that it occurs on

average only once every 100 years. Huff estimates that the dam has already prevented flooding during six major storms. Total cost was \$1.5 million.

Federal funding for the project was provided by SCS under the Watershed Protection and Flood Prevention Act (P. L. 566). The Farmers Home Administration arranged the community loan used to finance the water supply portion of the project.

Water plant manager of PA 638, Lou Ritter, said the dam provides more than enough water for the residents. Coupled with a new water treatment and purification system, the dam is providing some of the best water in the State, according to Ritter.

"The water leaving this plant is excellent water," Ritter said. "The water is 10 times less turbid than the State requires," he said. "And we know there's a direct correlation between turbidity and water purity."

Although water costs have increased since the town switched from the well to the reservoir water, community leaders see the cost as an investment in the future. "I kept stressing that some day we may not have that old well to depend on," Woodling said. "Now we have a long-term source of fresh water."

Ron Nichols, photographer, U.S. Department of Agriculture, Washington, D.C.



Improved water quality provided by PA 638 to the residents of Beaver Springs, Pa., is evident to Lou Ritter, water plant manager.

Emphasis is on reducing cropland erosion, improving water quality, improving the social and economic well-being of the residents, and improving environmental values and awareness.

Fred Jones is On Target

FRED JONES is an 82-year-old farmer in the small South Carolina community of Little Africa. He farms row crops and truck crops and raises cattle. His 138-acre farm is steeply sloping and subject to severe soil erosion.

Little Africa is a community of about 100 families in northeastern Spartanburg County. It lies within

the Pacolet River Watershed Project, a joint local, State, and Federal effort to help farmers establish conservation practices that will reduce erosion and protect water quality.

"It was hard to keep these fields from washing with corn and soybeans," Jones said. "It (the watershed project) has helped me plant one field to fescue and one to sericea, and I have more hay for my cows." His conservation plan also calls for field borders, contouring, crop residue management, grass buffer strips, and crop rotations for his truck crops.

The average family income in Little Africa is well below the State's median, and 50 years of farming without conservation treatment has

severely damaged much of the surrounding cropland. Severely eroded areas and small gullies are commonplace, and some of the cropland has been abandoned.

In July 1987, the Soil Conservation Service began targeting assistance to Little Africa and assigned a soil conservationist to assist the residents. This is a 3-year plan to increase project participation among the residents, most of whom are hesitant to adopt new technology. Emphasis is on reducing cropland erosion, improving water quality, improving the social and economic well-being of the residents, and improving environmental values and awareness.

The watershed project covers a total of 49,120 acres, of which 12,500 acres is cropland. The annual soil loss in the watershed is estimated to be 245,000 tons, of which 80,000 tons ends up in roads, ditches, and culverts. The average erosion rate of the cropland is 19.9 tons of soil loss per acre per year.

Since the project began in 1985, there have been 110 applications for technical and cost-sharing assistance, and conservation plans have been developed for 92 landowners. These plans cover 1,875 acres of cropland.

Sponsors include the Spartanburg County Soil and Water Conservation District, the South Carolina Land Resources Conservation Commission, and SCS. The project is one of 12 land treatment watershed projects sponsored by SCS in South Carolina.

Ann Rose, public affairs specialist, SCS, Columbia, S.C.



Fred Jones has developed a conservation plan to reduce soil erosion on his 138-acre farm in the Pacolet River Watershed, Spartanburg County, S.C.

"Many times, the first call a homeowner or builder makes is to an engineer, and if those engineers are using our programs and methods, we'll achieve some consistency in our procedures."

Training For Urban Watersheds

NOW, IF YOU'LL page down one, you'll see a worksheet for travel time through a subarea."

Eighteen keyboards clattered as their operators located the place agricultural engineer Cliff Baumer was talking about.

"Now, let's enter 75 feet as a shallow, concentrated flow length," Baumer said.

Again the keyboards in the University of Missouri-St. Louis computer room clacked in unison as Baumer, who at the time worked for the Soil Conservation Service in eastern Missouri, led the students step by step through a computer program of Urban Hydrology for Small Watersheds, SCS Technical Release 55 (TR-55).

TR-55 has long been a popular method for estimating runoff from small urban watersheds, but before it was placed on a computer program the calculations were a lengthy and involved procedure. Baumer's presentation was part of a 1-day workshop offered this past March by the soil and water conservation districts of St. Louis and St. Charles Counties, Mo., to help both municipal and private engineers use the program.

"Prior to this, unless these engineers had either worked with SCS or were familiar with NTIS (Nation-

al Technical Information Service), they didn't realize that TR-55 had been updated into a computer program," said Terry Buettgenbach, then district conservationist for SCS in St. Louis County and now serving at the agency's Midwest National Technical Center, Lincoln, Nebr. "There was no organized way of getting the information to them or familiarizing them with the program. Many engineers are really relieved to find out it is available as a computer program."

The workshop grew from a need to get the TR-55 program into the hands of engineers working in the rapidly urbanizing areas of Greater St. Louis.

"Both St. Charles and St. Louis Counties are experiencing tremendous growth and, with that, numerous runoff and erosion problems," said Dennis Alexander, SCS area conservationist. "Computer programs like this allow us to keep up with some of the problems in these two counties, and we're now planning additional workshops on specific erosion control practices to follow up on the TR-55 success."

Most of the engineers at the workshop agreed that the computer program is a great time saver. Many also felt it would enable them to consider the broader picture of their work, rather than simply seeing each job as a completely separate entity.

"It seems that we've always done things piecemeal," said Ron Rembold, an engineer with the city of St. Peters in St. Charles County. "We do one project at a time, and just assume that an area stream or watershed will handle it. There comes a time, though, when we're going to have to look at the larger

scope, and this workshop is just the first step."

Bill Seffens, soil conservationist for the St. Louis County Soil and Water Conservation District, noted that the workshop also gives the districts contact with local engineers and lets them know there is technical support available through the districts for specific runoff and erosion problems. "It gets our foot in the door, and also helps spread the district's work and methods. We just can't track down every person with a problem and get into their backyard. Many times, the first call a homeowner or builder makes is to an engineer, and if those engineers are using our programs and methods, we'll achieve some consistency in our procedures."

March was the second time the two conservation districts had joined forces to offer the TR-55 workshop. Since then the St. Louis Community College system has announced plans to offer the workshop as part of its continuing education series and to add a soils and urban erosion class. "This not only takes some of the pressure off our small staff," said Buettgenbach, "but it opens up a whole new pool of potential TR-55 users as well."

Janet J. Huber, former information specialist for the soil and water conservation districts of St. Louis, St. Charles, and Jefferson Counties, Mo., Manchester, Mo.

Barber said the project has reduced the amount of sediment entering the lake and made feasible a proposed million-dollar harbor project to dredge the lake.

River Town Develops

ALTHOUGH MORE floods may be in store for the little town of Maiden Rock on the Mississippi River in western Wisconsin, a new watershed protection project should minimize the damage.

This past June, the town celebrated completion of the watershed project—along with its new water and sewer facilities—as part of its “Rural Development Day” festivities. The watershed project included the installation of tile outlet terraces and other conservation practices that hold back and slowly release large amounts of rainwater. It is designed to prevent the kind of damage sustained

when severe flash floods struck this part of Pierce County in 1975.

“I’ve never seen that much debris generated by so small a watershed,” said Louis Barber, district conservationist for the Soil Conservation Service. Floodwaters flowed through the town and into the Mississippi River, which widens at this point to form Lake Pepin. The flood deposited rock as deep as 4 feet on the Great River Road along the river and caused about a half million dollars’ worth of damage in the town.

After the 1975 flood, SCS intensified its technical assistance to help landowners in the 865-acre watershed plan and apply conservation practices such as contour farming and conservation tillage. Grants and cost-sharing funds became available in 1982 when the project was authorized under the Watershed Protection and Flood Prevention Act, P.L. 566.

The community of about 200 people stands to benefit from the project in many ways. Over the

years, sediment had reduced the lake’s value for fishing and boating. Barber said the project has reduced the amount of sediment entering the lake and made feasible a proposed million-dollar harbor project to dredge the lake.

The watershed project consists of 45 acres of contour stripcropping with 600 feet of diversions, 290 acres of terracing with 64,165 feet of narrow-base parallel tile outlet terraces, 7 grade stabilization dams to stop gullyng, and 2 debris basins. Eighty-eight percent of all the cropland in the project area was treated, for a total of 335 acres. Much of the land was in continuous corn planted on an 8-percent slope before the project began.

Total cost for the project ran about \$450,000, with three quarters of the money coming from the P.L. 566 grants. About half the money was spent on land treatment and half on the debris basins, which are designed to catch sediment and organic material carried by floodwaters. SCS estimates that land in the watershed was eroding at a rate of 30 to 35 tons per acre per year and is now eroding well within the tolerable limits of 2 to 5 tons per acre per year.

“As a result of the watershed project and other improvements, rural development has real meaning in Maiden Rock,” Barber said.

Dave Leshuk, public affairs specialist, SCS, Madison, Wis.



Terraces protect Maiden Rock, Wis., by holding water dropped by heavy rainstorm. (Photo by Louis Barber.)

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Spillways Studied

DURING THE PAST several years, heavy rains in the central and southern United States have caused considerable erosion damage to earthen spillways on flood-control dams. In response, the Agricultural Research Service (ARS) of the U.S. Department of Agriculture at its Plant Science and Water Conservation Laboratory near Stillwater, Okla., has devised a model that simulates the conditions under which spillway erosion occurs.

With assistance from the Soil Conservation Service, ARS has developed a model of a vegetated spillway to test different grass covers in slowing erosive, fast-flowing waters at SCS flood control dams. Test results are applied to a mathematical model to determine which grasses are most effective at controlling erosion.

Dwain Phillips, public affairs specialist, SCS, Stillwater, Okla.

Machinist Roy Cox checks water velocity in chute used for testing grasses at Oklahoma facility of the Agricultural Research Service of the U.S. Department of Agriculture.

